

Generating k -irreducible triangulations of surfaces

Sebastian Melzer

June 21, 2016

Abstract

A triangulation of a surface other than S^2 is *k-irreducible* ($k \geq 3$) if it has edge width k and is contraction-minimal with that property. This class includes the well-studied irreducible triangulations ($k = 3$) as well as the contraction-minimal locally cyclic triangulations ($k = 4$). There already is a complete list of all 3-irreducible triangulations of the surfaces M_1, M_2, N_1, N_2, N_3 and N_4 . For N_1 , the 4-irreducible triangulations are known as well.

We present an algorithm that generates all k -irreducible triangulations of a fixed surface by vertex-splitting, starting with its $(k-1)$ irreducible triangulations. Using a parallel implementation of this algorithm, we gained new insights into ≤ 6 -irreducible triangulations of small 2-manifolds. In particular, we obtained the complete list of all 63 5-irreducible triangulations of N_1 , all 1196 4-irreducible triangulations of M_1 and all 2303 4-irreducible triangulations of N_2 .